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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/805,922	03/22/2004	Nicholas E. Ulion	EH-10557 (04-124)	2036
34704 7590 10/09/2007 BACHMAN & LAPOINTE, P.C. 900 CHAPEL STREET SUITE 1201 NEW HAVEN, CT 06510			EXAMINER PADGETT, MARIANNE L	
			ART UNIT 1792	PAPER NUMBER
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/805,922

Applicant(s)

ULION ET AL.

Examiner

Marianne L. Padgett

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1762

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11/7/2005, 8/2/2004 & 3/22/2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-25 is/are pending in the application.
- 4a) Of the above claim(s) 16-25 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-15 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 11/7/5.
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- ☐ Notice of Informal Patent Application
- ☐ Other: _____.

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1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
 - I. Claims 1-15, drawn to a method of producing thermal conductivity in thermal barrier coatings by incorporating porosity the use of a fugitive material, classified in class 427, subclass 566.
 - II. Claims 16-24, drawn to a thermal pure coating matrix having a porous network, classified in class 428, subclass 314.2 +.
2. The inventions are independent or distinct, each from the other because:

Inventions group I and group II are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make another and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case, the product can be made by different processes, such as employing techniques that deposit a porous material without use of a "fugitive" material, such as various spraying techniques, which depending on parameters can produce various degrees of porosity.

3. Because these inventions are independent or distinct for the reasons given above and there would be a serious burden on the examiner if restriction is not required because the inventions have acquired a separate status in the art in view of their different classification, restriction for examination purposes as indicated is proper.

Because these inventions are independent or distinct for the reasons given above and there would be a serious burden on the examiner if restriction is not required because the inventions have acquired a separate status in the art due to their recognized divergent subject matter, restriction for examination purposes as indicated is proper.

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Because these inventions are independent or distinct for the reasons given above and there would be a serious burden on the examiner if restriction is not required because the inventions require a different field of search (see MPEP § 808.02), restriction for examination purposes as indicated is proper.

4. Applicant is advised that the reply to this requirement to be complete must include (i) an election of a species or invention to be examined even though the requirement be traversed (37 CFR 1.143) and (ii) identification of the claims encompassing the elected invention.

The election of an invention or species may be made with or without traverse. To reserve a right to petition, the election must be made with traverse. If the reply does not distinctly and specifically point out supposed errors in the restriction requirement, the election shall be treated as an election without traverse.

Should applicant traverse on the ground that the inventions or species are not patentably distinct, applicant should submit evidence or identify such evidence now of record showing the inventions or species to be obvious variants or clearly admit on the record that this is the case. In either instance, if the examiner finds one of the inventions unpatentable over the prior art, the evidence or admission may be used in a rejection under 35 U.S.C.103(a) of the other invention.

4. During a telephone conversation with Barry Kelmachter on 7/11/2007 a provisional election was made with traverse to prosecute the invention of group I, method claims 1-15. Affirmation of this election must be made by applicant in replying to this Office action. Claims 16-25 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

5. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

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6. Claims 1-15 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Use of relative terms that lack clear metes and bounds in the claims, or in a clear definition in the specification or cited relevant prior art, is vague and indefinite. In claim 1, line 1, see "reducing", which is relative & fails to define with respect to what the thermal conductivity has been reduced.

In claim 2, "7YSZ" is an undefined acronym, which needs to be defined for its use in the claim. In particular, for what does the "7" stand? Also, the Markush group is improper, as its **genus** is **ceramics**, but "zirconium" is a **metal**, not a ceramic, hence is not a proper **species** thereof. Note if zirconia was intended (which is not supported by [0015] in the disclosure), then "7YSZ" would completely overlap with zirconia, thus still be improper as a not mutually exclusive species.

In claim 5, it is unclear as written when one is intended to be "utilizing" particulate matrix & particulate fugitive material. Is it before or after deposition? Note claims 6 & 7 have the same failing with respect to claimed ingots or targets, respectively, except in these cases an ingot or a target cannot be deposited, while a deposition can be particulate in nature.

While not a 112 problem *per se*, the examiner is unclear as to what real significance there is or is intended (if any) between the ranges of claims 8 & 9, as the "incipient melting point" would be just a fraction of a degree below the actual melting point, hence the ranges as claimed are barely different.

In claim 11, "at least 90% of said fugitive material" is vague and indefinite, as it does not state what basis upon which the percentage value is calculated, i.e. moles, weight, volume, etc., thus cannot be accurately determined or compared.

In claim 12, it is unclear when the additional layer of substantially fugitive free TBC mixture is applied, and at it is required to be a mixture, what is it mixed with, if not the fugitive material?

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In claim 13, how does one preform "alerting the rate"? Is this a typographical error? Note, as written, except for the "alerting", which has no understandable meaning, the steps performed have no difference from the independent claim, but the results are further required to have graduated porosity.

In claim 14, exactly what in the poorest network of the layer is supposed to be comprised of "not greater than 40 % of said layer by volume", the network itself (i.e. the TBC matrix & any remaining fugitive material), or the voids, or just the TBC, etc.? Any of the possible options may be considered to read on the claim.

In claim 15, how does the gas turbine engine component relate to the "part" claimed in the independent claim? Are they the same or is this an additional requirement?

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary.

Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of

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each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

8. Claims 1-4, 6, 8-10 & 15 are rejected under 35 U.S.C. 102(e) as being clearly anticipated by Movchan et al. (EP 1327698 A).

Claims 7, 11 & 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Movchan et al.

Movchan et al. teach EB-PVD of thermal barrier coatings (TBC) material using ingots of either mixed material or separate ingots of several percent yttria in yttrium stabilize zirconia, and of graphite as a carbon source, to deposit a mix to layer containing carbon, which is then thermally treated, such as by centering (950°C or 900-1200°C, i.e. 1768°F or 1678-2118°F), so as to remove the carbon, i.e. fugitive material, and thus maintain or increase the porosity of the initially deposited EB-PVD layer. Note that the sintering process by definition is not a process that melts, hence would not have melted the substrate. Mentioned substrates include superalloy gas turbine components. Exemplary experimental data discusses initial depositions having open porosity of 32 volume % as compared to 12% for conventionally deposited 7% YSZ, after which heating was performed & resulting densities measured (% porosity not given). See the abstract, [0019], [0021-25] & [0028-29].

While particular volume percentage porosity after heating is not given, it is taught that the porosity may be increased by the heating process, hence it would have been obvious to one of ordinary skill in the art to employ the thought process to produce such taught increases in porosity, which would have been expected to include volume percentage values for porosity greater than 32 volume %, thus one of ordinary skill in the art would expect such porosity values to include possible meanings of claim 14.

Movchan et al. discusses chemical mechanisms by which the carbon is removed by posttreatment heating processes, but does not mention a value percentage (basis unspecified) of carbon removed or

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remaining, however it is apparent from the overall discussion that the majority of the carbon would have been expected to be removed as gaseous products, thus would have been obvious for one of ordinary skill in the art to heat sufficiently to remove on the order of 90 % of the carbon as claimed, especially considering the carbon *per se* is not a desired structural component, but intended to be removed, especially for the taught increase in porosity, and it would have been further obvious to one of ordinary skill in the art to optimize this removal & the taught increase in porosity via optimization of the heating technique to optimize the taught porosity increase, for which one would have expected to produce with larger concentrations of carbon material as per discussion in [0029]. Also given the lack of significant differentiation in process steps, results would have been expected to be inherently the same.

While Movchan et al. do not discuss a target with homogeneous mixture of carbon & TBC material, they do discuss that just ingot containing both materials to be deposited may be employed ([0022]), hence it would've been obvious to one of ordinary skill in the art when employing a single target to use a homogeneous mixture of material, otherwise when electron beam evaporation at a localized site on the ingot (= target) cannot occurs, nonuniform evaporation of material would occur resulting in highly nonuniform compositional deposits, which could create defects in the product, such as overly large voids, which when treated to remove the carbon could create discontinuities in the barrier layer.

9. Claims 1-5, 8-9, 12-13 & 15 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by Strangman (5,624,721).

Claims 10-11 & 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Strangman (721).

Strangman (721) teach deposition of TBC layers, including yttria stabilize zirconia, on superalloy turbine engine vanes or blades, where a series of EP-PVD deposits are sequentially made, such that the initial deposition is an unstable porous TBC layer (no fugitive material & expected to densified on sintering), then the TBC porous layer is deposited with tungsten or molybdenum, where the source for EB

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evaporation may be a powder mixture of W or Mo powder with the TBC material. EP-PVD processes at 950-1100°C are taught to effect stabilization of the porosity as deposited, such that the thermal conductivity of the ceramic player is reduced in comparison with densified sintered materials. Alternately, it is also taught to grow and stabilize the porosity via an oxidizing post coating heat treatment, where the W or Mo components are removed by oxidation to gaseous oxides, whose difficulty in diffusing out during the sintering process prevents densification, thus growing & stabilizing the porosity. The surface of the stabilize that TBC layer has its pores coated with noble metals, which effectively decreases the porosity at the surface, such that there can be said that the overall structure of the TBC coating has varied porosity, hence a gradient. In Strangman, particularly see the abstract; figure; col. 3, line 35-col. 4, line 56.

While specific temperatures for posttreatment heat treatment alternative are not discussed, the deposition temperatures for as deposited stabilized porous material would have been expected to provide one of ordinary skill in the art with a starting point for routine experimentation, to determine optimum temperatures required to effect analogous results in a posttreatment of a complete thickness of a deposit, rather than occurring as depositing, plus note Strangman also mentions growing, as opposed to merely stabilizing the porosity in the posttreatment, for which temperatures expected to grow, i.e. increase, the porosity, when optimize would have been expected to be inclusive of higher claimed temperature ranges.

While the percentage of fugitive material liberated, or the porosity percentage value, or the like are not provided, it would have been obvious to one of ordinary skill in the art to employ the teachings of Strangman to optimize the porosity in order to optimize production of the low thermal conductivity consistent with the teachings, which would have been expected to effect values as claimed, especially considering the uncertainty of their meaning as discussed above & the lack of significant different processing steps.

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10. The references of Darolia et al. (6,808,799 B2 & 7,087,266 B2) are substantially equivalent to Movchan et al. (EP) as applied above in section 8, while Allen et al. (2002/0172837 A1) is also substantially equivalent, except that as set forth in [0056] posttreatment heating of TBC layers containing fugitive material, such as graphite, is done at preferably 450°C. References of Gorman et al. (2007/0116883 A1) & Nelson et al. (7,150,921 B2) are also of interest for making porous TBC coatings, but are not prior art.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Marianne L. Padgett whose telephone number is (571) 272-1425. The examiner can normally be reached on M-F from about 8:30 a.m. to 4:30 p.m.

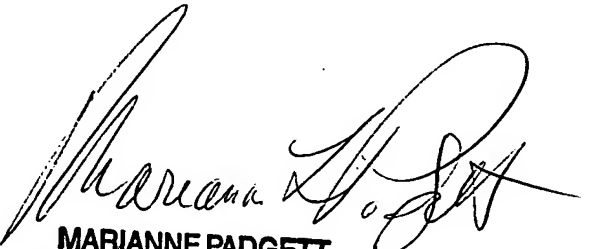
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks, can be reached at (571) 272-1423. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

MLP/dictation software

7/11/2007

10/1/2007



MARIANNE PADGETT
PRIMARY EXAMINER